The Evolution-Creation Controversy: Opinions from Students at a "Liberal" Liberal Arts College[1]

MICHAEL ZIMMERMAN, Department of Biology, Oberlin College, Oberlin, OH 44074

ABSTRACT. A questionnaire dealing with selected issues in the evolution-creation debate was distributed to 362 students at Oberlin College, Oberlin, Ohio. Because the survey was originally developed and distributed at Ohio State University, comparisons could be made between university students and individuals enrolled in a small, highly selective liberal arts college. Most Oberlin students claim that they believe in evolutionary theory (89%) and recognize both that it has a solid scientific foundation (88%) and that most scientists accept its scientific validity (92%). Over one-half of the students surveyed (56%) thought, however, that creationism should be introduced into the public schools. At the same time, over one-half of those surveyed (60%) also felt that such an introduction into the public schools would constitute the teaching of religious principles. A very small fraction of the respondents had a sophisticated view of evolution (7%), but many (68%) were able to identify various components of natural selection. Evolutionary sophistication and rejection of creationism increased as a function of the amount of biology instruction received. The Oberlin students differed from the Ohio State students in that significantly more of the former: 1) accepted evolutionary theory; 2) recognized that teaching creationism in the public schools means introducing religion there; 3) were taught evolutionary theory in high school; and 4) accept the fact that scientists consider evolutionary theory to be valid. The results suggest that large numbers of people are ignorant of the specifics of both evolutionary theory and "creation science" and, therefore, are susceptible to the creationist argument that keeping creationism out of the classroom is an infringement of academic freedom and freedom of speech.

OHIO J. SCI. 86 (4): 134-139, 1986

INTRODUCTION

In general, there appears to be great confusion about and reluctance to accept the basics of evolutionary theory. The results of numerous polls demonstrate consistently that the populace is in favor of forcing teachers in public schools to teach the tenets of "creation science" as well as the concepts of modern evolutionary theory. Sampling, for example, performed by groups as diverse as the Associated Press, NBC, Glamour magazine, and the Institute for Creation Research's Midwest Center yielded similar results; between 74% and 86% of the people questioned wanted creationism brought into the classroom. These polls further indicate that a significant portion of the respondents (10-16%) prefer that *only* the creation model be taught.

A smaller number of surveys of university students have been performed. Bergman (1979) questioned students at Bowling Green State University, Bowling Green, Ohio. Of the 442 undergraduate students that he examined (most of whom were in the final year of a teacher training program), 93.9% favored introducing the creation model into the classroom. Of the 74 graduate students that were sampled (all of whom were taking courses in biology), 77.8% held that same opinion. Only five of 516 students questioned were actually majoring in biology, however. Fuerst (1984) surveyed 2,387 students taking science courses at the Columbus campus of Ohio State University, and found that 80% favored bringing the creation model into the public school classroom. Finally, a 38 year longitudinal study of student views on creationism was performed at Brigham Young University, Provo, Utah from 1935 to 1973 (Christensen and Cannon 1978). They found that while only 36% of the students questioned in 1935 agreed with the statement, "Man's creation did not involve biological evolution," 81% of those surveyed in 1973 agreed. Similarly, in 1935, 5% concurred with the statement, "The world's creation did not take millions of years," while 27% concurred in 1973. They concluded that acceptance of creationism has been growing among university-age students during this period.

Clearly, the general public and those university students sampled are at odds with professional evolutionary biologists. The professional view, ignoring the ongoing debate concerning the specific mechanisms of evolutionary change, was best summarized in the title of a paper by Theodosius Dobzhansky (1973): "Nothing in Biology Makes Sense Except in the Light of Evolution." When the public disagrees with such a basic statement, a serious communication gap certainly exists between the professionals and the lay public. This gap can have serious social implications because of the influence of public opinion on curriculum determination in the public schools. Bergman (1979) went as far as to conclude that since a majority of people favor the two-model approach, educators should move in the direction of implementing such a method of presentation. If, as Dobzhansky said, biology makes no sense in the absence of evolutionary theory, then what might we expect students to learn when biology is presented within a "creation science" context?

The present study is yet another attempt to sample popular opinion concerning the evolution-creation controversy. It differs significantly from the others in two respects, however. Firstly, the sample population is comprised exclusively of students enrolled at a private liberal arts college. Secondly, the questionnaire distributed was identical to that used by Fuerst (1984), and thus a direct

[1]Manuscript received 4 November 1985 and in revised form 9 January 1986 (#85-56).

comparison of results is possible. Fuerst's study addressed three questions: (1) Do the responses of university students differ from the public at large?; (2) Is there an understanding of the basics of evolutionary theory?; and (3) Do opinions change as a function of exposure to evolutionary ideas? The current study permits these questions to be answered for a portion of the population that has not been previously sampled explicitly. The results should indicate how pervasive the permissive feelings towards "creation science" are in society.

OBERLIN COLLEGE. Oberlin College is a highly selective, independent, coeducational institution located in Oberlin, Ohio. The college has approximately 2,750 students, 82% of whom are enrolled in the College of Arts and Sciences. The remaining 500 students study at the Conservatory of Music. Oberlin is accredited by the North Central Association of Colleges and Secondary Schools and the National Association of Schools of Music. Oberlin College occupies a unique position among American colleges and universities. It was the first college to grant undergraduate degrees to women and the first to admit students regardless of race. The common perception among students, faculty, and administrators of Oberlin College is that Oberlin continues to be a haven for liberal ideals, attracting high quality students who lean further to the left of the political spectrum than do students enrolled elsewhere.

Oberlin College and Ohio State University participate in the Cooperative Institution Research Program sponsored by the Higher Education Research Institute at the University of California, Los Angeles. Part of this program is the administration of a questionnaire to incoming freshmen each academic year. The results of a number of questions from the survey administered in September, 1984 allow a direct comparison between Oberlin and Ohio State students. Additionally, comparison can be made with a reference group of 4-year, nonsectarian, private, very highly selective colleges across the country. Five questions were most pertinent to the present study. Firstly, students were asked to characterize their own political orientation (far left, liberal, middle of the road, conservative, far right). Oberlin students considered themselves far more liberal than students at either Ohio State or at the schools in the reference group ($p < 0.001$ for both, Kolmogorov-Smirnov two-sample test; Siegel 1956). In fact, 73.3% of Oberlin students ranked themselves as liberal or far left, whereas only 19.8% of the Ohio State students and 38.4% of the students in the reference group so ranked themselves. Secondly, students had to indicate the type of high school they attended (public, private denominational, private nondenominational, other). Oberlin students differed significantly from those at Ohio State, but not from those in the reference group ($p < 0.05$, $p > 0.10$, respectively, Kolmogorov-Smirnov two-sample test). The greatest difference was the large percentage of Oberlin students coming from private nondenominational high schools (20.8% versus 1.4% for Ohio State students).

Thirdly, students were asked to estimate the income of their parents. Again, Oberlin students differed significantly from Ohio State students, but not from pupils in the reference group ($p < 0.025$, $p > 0.10$, respectively, Kolmogorov-Smirnov two-sample test). The median estimated income at Oberlin was approximately $50,000 per year, whereas it was approximately $35,000 per year for the parents of Ohio State students. Fourthly, students were asked to state their religious preference. The percentages of students selecting "none" varied quite widely among the three groups. Only 9.7% of Ohio State freshmen stated that they had no religious preference, whereas 21.4% of the students in the reference group and 38.9% of the Oberlin students expressed such an opinion. Finally, the questionnaire asked whether students had attended a religious service during the past year. Fewer Oberlin respondents (69.7%) answered this question affirmatively than did either Ohio State students (85.9%) or freshmen in the reference group (80.1%). Additionally, the 1986 version of the Peterson Guide to Colleges presents math and verbal scores from the Scholastic Aptitude Test. Oberlin students scored significantly higher ($p < 0.001$ for both, Kolmogorov-Smirnov two-sample test) in both categories than did those enrolled at Ohio State.

METHODS AND MATERIALS

The nine-item questionnaire developed by Fuerst (1984) was distributed to students in four courses on the first day of classes during the fall semester of 1985. Four of the questions were identical to the Glamour (August, 1982) survey; thus a direct comparison among Oberlin students, Ohio State students, and Glamour readers is possible. The full questionnaire is presented in Appendix I.

The four courses surveyed included three biology classes and one english course. Biology 111 (144 responses), Introduction to Genetics and Population Biology, is typically the first college-level biology course taken at Oberlin. The course is populated almost exclusively by first and second year students. In addition to other topics, this course presents the basics of modern evolutionary theory. Biology 113 (91 responses), Introduction to Cell and Molecular Biology, is required of all Biology and Psychobiology majors at Oberlin and has Biology 111 as a prerequisite. Most students enrolled in the course are in their third or fourth year at Oberlin. Biology 205 (11 responses), Plant Ecology, is an upper level course with an evolutionary focus and an enrollment prerequisite of Biology 111. Most of the students enrolled in the course are seniors. The number of responses from this course was so small because a large number of students were enrolled concurrently in Biology 113. Students were asked not to fill out the questionnaire a second time. English 108 (116 responses), Reading Fiction, is an introductory english course designed for freshmen and sophomores.

RESULTS

Table 1 presents the percentage of "yes" responses, arranged by course, to six of the items on the questionnaire. Question 1 asked students whether they believed in Darwin's theory of evolution. An overwhelming majority of students said that they did believe in this theory (89.2%). No trend was apparent with respect to previous college-level biology courses taken. These results are in sharp contrast to both the Ohio State sample and the Glamour survey. Only 63% of the Ohio State students replied affirmatively to this question, whereas 47% of the Glamour respondents answered in a similar fashion. Additionally, the results of the Ohio State survey indicated that students that had already taken a number of biology courses were more likely to answer this question affirmatively than those enrolled in introductory courses.

The second question asked whether a two-model approach should be used in public schools. The total percentage (56.3%, Table 1) of students in favor of bringing creationism into the public schools was markedly lower than the figures from both Ohio State (80%) and the Glamour survey (74%). As in question 1, the responses to this question did not appear to vary as a function of

TABLE 1

Percentage "yes" answers to questions 1–3, 5, 8, and 9 posed in four courses: E108 (Reading Fiction); B111 (Introduction to Genetics and Population Biology); B113 (Introduction to Cell and Molecular Biology); and B205 (Plant Ecology).

Question	N	Course				Total
		E108	B111	B113	B205	
1. Do you believe in theory of evolution?	362	90.5	89.6	86.8	90.9	89.2
2. Should creationism be taught in public schools?	355	58.9	59.9	47.3	60.0	56.3
3. Is creationism religion in public schools?	347	56.8	62.3	61.8	55.6	60.2
5. Were you taught evolution in high school?	357	87.9	87.2	94.4	81.8	89.1
8. Do scientists doubt evolutionary theory?	351	7.0	13.8	4.6	18.2	9.4
9. Does teaching evolution lead to decay of society?	344	3.6	10.3	6.8	12.5	5.8

previous biology coursework. This pattern was evident in the Ohio State samples. The responses to question 2 varied as a function of the response to question 1 (Table 2). Of the Oberlin students expressing a belief in evolutionary theory, 52.6% thought that creationism should be taught in the public schools, whereas 85.7% of those doubting evolution wanted creationism taught. Corresponding percentages from the Ohio State survey were 74% and 91%. Ohio State students who believed in evolution were thus significantly more likely to desire a two-model approach in the public schools than were Oberlin students who accepted evolutionary theory ($p < 0.0001$, Chi-square test). No significant difference existed, however, among students who rejected the theory of evolution ($p = 0.18$, Fisher exact probability test); overwhelming percentages of both groups wanted creationism introduced into the public schools.

Question 3 asked whether religion is being introduced into the public schools when creationism is taught there. Again, there appeared to be no relationship between previous biology coursework and the answer to this question. Overall, 60.2% of the Oberlin students acknowledged that teaching some version of creationism in the public schools amounted to introducing religion into the curriculum (Table 1). Significantly more Oberlin students than Ohio State students (42%) held this view ($p < 0.001$, Chi-square test). As in the Ohio State sample, students who answered question 1 affirmatively were significantly more likely to agree with this point (Table 2, $p < 0.0001$, Chi-square test). The majority of Oberlin students who professed a disbelief in evolution did not indicate that teaching creationism was a religious undertaking. The subset of Oberlin students who did not believe in evolutionary theory did not differ from Ohio State students in this regard ($p > 0.05$, Chi-square test). Interestingly, of the students who responded negatively to question 3, the majority wanted creationism taught in the public schools (85.5%), whereas 33.0% of those responding affirmatively wanted it introduced into the public schools.

Question 4 offered a number of options for introducing creationism into the public school classroom. The wording of the question (If you think Darwinism and creationism are both valid theories, what is the best way to teach them?) led many people (26.2%) to omit the question, that is, many Oberlin students apparently do not find both Darwinism and creationism to be valid theories. In contrast, only 5.4% of the Ohio State sample omitted this question. Table 3 presents the responses by course for those Oberlin students who answered the question. The most popular option was to change either textbooks or school curricula (42.3%). This option was also the most favored response in both the Ohio State (62%) and Glamour (61%) surveys, although significantly fewer Oberlin students chose this option relative to those at Ohio State ($p < 0.0001$, Chi-square test).

A number of trends suggesting an influence of biology background upon mechanisms for implementing the teaching of creationism can be seen in Table 3. Students in the more advanced biology courses recommended that texts be changed far less frequently than did others. A similar pattern was also evident in the Ohio State survey. There was also a positive relationship in the Oberlin sample between biology background and the desire to require both biology and religion courses, as well as the frequency with which the "other" option was chosen.

TABLE 2

Relationship between answers to question 1 and responses to other questions.

Percentage "yes" responses to:	Answer to question 1	
	Yes	No
Question 2	52.6	85.7
Question 3	58.8	38.1
Question 5	87.9	81.0
Question 8	9.6	9.5
Question 9	5.3	19.0

TABLE 3

Percentage of students ($N = 267$) in favor of various methods of implementing the teaching of creationism in public schools. Students were polled in four courses: E108 (Reading Fiction); B111 (Introduction to Genetics and Population Biology); B113 (Introduction to Cell and Molecular Biology); and B205 (Plant Ecology).

Method of implementation	Course				Total
	E108	B111	B113	B205	
Require biology and religion courses	7.5	10.9	15.5	20.0	10.9
Teach creationism at home	16.0	16.4	15.5	20.0	16.1
Change texts	50.0	40.9	34.5	20.0	42.3
Other	26.6	31.8	34.5	40.0	30.7

Question 5 asked students whether they had been exposed to evolutionary theory in high school. An overwhelming fraction (89.1%, Table 1) of the respondents remember being taught evolution in high school. Significantly more Oberlin students were apparently so exposed than were Ohio State students (73%, $p < 0.001$, Chi-square test). A possible explanation for this difference is the fact that so many more Ohio State students (98.2%) attended either public or private denominational high schools than did Oberlin enrollees (78.4%). Table 2 suggests that early exposure to evolution might play a slight role in later acceptance of evolutionary theory.

Question 6 allowed students to indicate which phrase best describes the modern theory of evolution. The correct answer is the one dealing with differential reproductive rates (B). As Fuerst points out, the remaining options differ to varying degrees from the correct description. Answers A and E both deal with survival, and thus are related to the concept of differential reproduction: dead organisms cannot reproduce. Neither C nor D can be considered to be accurate descriptions of modern evolutionary theory.

The results from question 6 (Table 4) show a number of interesting similarities and differences with the Ohio State survey. Firstly, a very small percentage of students in either sample chose the correct answer (6.7% for Oberlin; 8% for Ohio State). Secondly, both groups demonstrated increasing evolutionary sophistication as a function of biology background. Table 4 indicates that the percentage of correct answers increased steadily through the four courses. Additionally, the percentage of students giving one of the "natural selection" answers (A, B, or E) also increased quite dramatically. In every course the largest percentage of students selected answer A, whereas in three of the four courses the incorrect answer D was chosen with the second highest frequency. Significantly more Oberlin students (67.9%) chose one of the "natural selection" answers than did Ohio State students (48%; $p < 0.0001$, Chi-square test). Even those Oberlin students with no college-level biology background (i.e., those pupils enrolled in E108 and B111) preferred one of the "natural selection" answers. Oberlin students in more advanced biology courses (i.e., B113 and B205) compared quite favorably to graduate genetics students (Fuerst 1984) with respect to the frequency with which they selected either the correct answer or one of the "natural selection" options.

Question 7 requested that students indicate whether the modern theory of evolution has a valid scientific foundation. The majority of Oberlin students (87.6%) feel comfortable with the underlying scientific basis of evolutionary theory (Table 5). Significantly more Oberlin students hold this view than do Ohio State pupils (59%; $p < 0.001$, chi-square test). Both studies found that the proportion of people accepting evolutionary theory as scientific increased as the course level increased. Striking differences exist among the responses by Oberlin students to this question when they are examined in light of the responses to question 1 (Table 6). Approximately 90% of those students who said they believed in the theory of evolution also felt that it has a solid scientific foundation. On the other hand, 55.6% of those not believing in evolutionary theory thought that the theory was solid science.

Question 8 asked students whether they thought that most scientists accept evolution as a valid scientific concept. Only 9.4% of the Oberlin sample stated that they thought that scientists had trouble with evolution (Table 1). Significantly fewer Oberlin students held this view than did Ohio State pupils (25%; $p < 0.0001$, Chi-square test). Table 2 demonstrates that Oberlin students' personal acceptance or rejection of evolutionary theory is independent of whether they feel that scientists accept the theory or not. In contrast, 40% of the Ohio

TABLE 4

Percentages of answers (N = 327) to question 6 concerning possible descriptions of evolution. Students were polled in four courses: E108 (Reading Fiction); B111 (Introduction to Genetics and Population Biology); B113 (Introduction to Cell and Molecular Biology); B205 (Plant Ecology).

	Course				
	E108	B111	B113	B205	Total
Survival of fittest (answer A)	53.2	48.4	56.6	66.7	52.6
Different # of offspring (answer B)	0.9	4.8	15.7	22.2	6.7
Strong eliminate weak (answer E)	5.4	11.3	9.6	0.0	8.6
Natural selection (either A, B or E)	59.5	64.5	81.9	88.9	67.9
Evolution from gorilla (answer C)	2.7	7.3	0.0	0.0	3.7
Purposeful striving (answer D)	37.8	28.2	18.1	11.1	28.4

TABLE 5

Percentages of answers (N = 315) to question 7 concerning the validity of evolutionary theory. Students were polled in four courses: E108 (Reading Fiction); B111 (Introduction to Genetics and Population Biology); B113 (Introduction to Cell and Molecular Biology); B205 (Plant Ecology).

	Course				
Choices	E108	B111	B113	B205	Total
A. Yes, because testable	58.7	55.6	59.8	77.8	58.3
B. Yes, but not testable	24.8	31.8	32.2	22.2	29.3
C. No, because not testable	3.7	4.0	0.0	0.0	2.7
D. No, based on speculation	10.1	5.6	5.8	0.0	7.0
E. No, other reasons	2.8	3.2	2.3	0.0	2.7

TABLE 6

Relationship between responses to question 1 and answers to question 7.

	Answer to question 1	
Percentage to question 7	Yes	No
A	59.6	38.9
B	30.0	16.7
C	2.4	5.6
D	5.7	27.8
E	2.4	11.1

State students who did not believe in evolution also felt that scientists did not accept it as a valid scientific theory. These results and those presented in Table 6 suggest the somewhat paradoxical conclusion that many of the Oberlin students that do not accept evolutionary theory hold that view despite the fact that they personally believe that it is a valid scientific concept and that most scientists accept it as such.

The final question asked students to speculate on the effect that the teaching of evolution in public schools might have on society in general. Only 5.3% of the Oberlin sample perceived a negative effect (Table 1), whereas significantly more students in the Ohio State group had that feeling (22%; $p < 0.0001$, Chi-square test). As in the Ohio State survey, approximately three times as many students who did not believe in evolution felt that the teaching of evolution was dangerous to society (Table 2).

DISCUSSION

Opinions expressed by Oberlin College students concerning the evolution-creation debate differed significantly from those of Ohio State students. In most cases, however, the differences were quantitative and not qualitative. Although the percentages are lower for the Oberlin survey than for the Ohio State sample, a distressingly large fraction of Oberlin students wants creationism introduced into public school classrooms. The wording of question 2 does not allow a distinction to be made between those students who actually want creationism given equal time with evolution and those who prefer a more cursory treatment. That such a large percentage of Oberlin students desires that creationism be brought into the public schools in any form is particularly troublesome when viewed in light of the following statistics. A large percentage of Oberlin students: (1) believe in evolutionary theory; (2) recognize that teaching creationism in public schools constitutes introducing religious teaching in those schools; (3) were taught about evolution in high school; (4) accept the fact that evolutionary theory is a valid scientific concept; (5) recognize that scientists themselves readily accept the premises of modern evolutionary theory; and (6) appear to consider themselves more liberal than both the general public and students at comparable types of colleges. That a majority of this type of group would want creationism brought into the public school classroom strongly suggest that all segments of American society probably have similar, if not more extreme, views. Before the studies of Bergman (1979) and Fuerst (1984) it might have been possible to dismiss the results of the popular polls by saying that the majority of people contacted probably were not overly aware of the issue and were not well-educated. The results of Bergman (1979) and Fuerst (1984) demonstrated that science-oriented university students held views that were indistinguishable from the rest of the public. Their polls were performed, however, at large, relatively conservative state universities. The present study, conducted at one of the country's more liberal liberal arts colleges, lays to rest any lingering doubts that may have existed: the desire for a two-model approach to the study of evolution is extremely pervasive.

It is not easy to identify the reasons why creationism has such widespread acceptance. Three possibilities seem most probable, however. Firstly, the general public has a poor understanding of how scientists work in general (Koshland 1985) and of the facts of evolution in particular. Evolution is often portrayed as a mere "theory" that cannot be "scientifically" tested, and that is accepted by scientists on faith. Under such conditions it is not surprising that people feel that it should not be taught alone. However, this sort of explanation does not explain the Oberlin results very well because Oberlin students, in large number, accept the validity of evolutionary theory. Instead, it seems possible that Oberlin students have responded to the creationists' cry for equal time (e.g., Morris 1974, Morris and Rohrer 1982). Anything short of this is seen as an infringement of academic freedom. This type of free speech argument is probably fairly persuasive across all portions of the political spectrum, but may be more compelling to people holding very liberal views, like Oberlin students. It seems to be this tack that the creationists, in large measure, have decided to follow (Edwords 1980, Lewin 1981, Nelkin 1982). Finally, it seems probable that not many people are very knowledgeable about the specifics of "scientific creationism," and that the creationists are delighted by this ignorance (Edwords 1980). As long as "scientific creationism" has the facade of respectability, the free speech/academic freedom argument will continue to sway appreciable numbers of people.

It is also noteworthy that an appreciable portion of the liberal arts students sampled thought that textbooks should be altered to include greater references to creationism. It is curious that this comes at a time when high school biology texts are under attack for not including much, if any, coverage of evolution (Skoog 1979, Moyer and Mayer 1985), and when California (finally) rejected a large number of texts for just this reason. Again, this points to the fact that the evolution-creation controversy is being fought as a public relations war, and that the creationists are prevailing. People appear to be forming their opinions in this matter not on the basis of facts but rather on some presumed sense of fairness.

The results of the present survey are consistent with Fuerst's (1984) conclusion that the amount of biology education experienced by students is associated with an increasingly favorable attitude towards evolution, and an increasingly negative attitude towards creationism. What cannot be determined from either study is whether students continuing on in biology are more favorably predisposed toward evolution or if their views are actually changed by coursework. In either case, what is unsettling is the fact that only a small number of students in either survey had a particularly sophisticated understanding of evolution, as indicated by their responses to question 6. Evolutionary theory may be accepted by students with previous biology coursework, but it is not necessarily understood by them. As noted by Fuerst (1984), these data suggest that biology educators are not doing an acceptable job of conveying the scientific basis of evolutionary theory to their students. Even more important is the general public's ignorance of both scientific methodology and evolutionary concepts. When this is coupled

with the public's ignorance of the (biblical) origins and concepts of "creation science", it becomes clear that well-informed decisions are not being made.

Although it does not make sense educationally for science curricula to be determined by popular opinion, this appears to be the trend. It is thus critically important for evolutionary biologists to work more directly at educating the public about the facts of evolutionary biology and the shortcomings of "creation science".

ACKNOWLEDGMENTS. I thank all of my colleagues who took valuable class time to distribute the questionnaire, and the students who answered the questions. I also appreciate the efforts of Sarah Shafer who carefully waded through the raw data in an effort to make sense of the responses, and Abby Frucht for reading the manuscript and suggesting improvements. Finally, I thank the Dana Foundation for support.

LITERATURE CITED

Bergman, J. 1979 The attitude of university students toward the teaching of creation and evolution in the schools. Origins 6: 60-70.

Christensen, H. T. and K. L. Cannon 1978 The fundamentalist emphasis at Brigham Young University: 1935-1973. J. Scientific Study of Religion 17: 159-164.

Dobzhansky, T. 1973 Nothing in biology makes sense except in the light of evolution. Amer. Biol. Teacher 35: 125-129.

Edwords, F. 1980 Why creationism should not be taught as science. Part 1. The legal issues. Creation/Evolution 1: 2-23.

Fuerst, P. A. 1984 University student understanding of evolutionary biology's place in the creation/evolution controversy. Ohio J. Sci. 84: 218-228.

Koshland, D. E., Jr. 1985 Scientific literacy. Science 230: 391.

Lewin, R. 1981 A response to creationism evolves. Science 214: 635-638.

Morris, H. M. (ed.). 1974 Scientific Creationism. Creation-Life Publishers, San Diego, California.

Morris, H. M. and D. H. Rohrer (eds.). 1982 Creation—The Cutting Edge. Creation-Life Publishers, San Diego, California.

Moyer, W. A. And W. V. Mayer 1985 A Consumer's Guide to Biology Textbooks 1985. People for the American Way, Washington, D.C.

Nelkin, D. 1982 The Creation Controversy. W. W. Norton and Company, New York.

Siegel, S. 1956 Nonparametric Statistics for the Behavioral Sciences. McGraw-Hill Book Company, New York.

Skoog, G. 1979 Topic of evolution in secondary school biology textbooks: 1900-1977. Science Education 63: 621-640.

APPENDIX 1

THE QUESTIONNAIRE

1. Do you believe in Darwins's theory of evolution? A. Yes; B. No. (Students who answered neither or both were classified as unsure.)

2. If Darwin's theory of evolution is taught in public schools, should other views (including the divine origin of life through special creation) be taught too? A. Yes; B. No.

3. Do you think that scientists are right in their argument that by giving creationism equal time they are allowing religion into the public schools? A. Yes; B. No.

4. If you think Darwinism and creationism are both valid theories, what is the best way to teach them? A. Require all students to take courses in biology and religion; B. Teach creationism at home; C. Change textbooks or school curricula to present both theories; D. Other.

5. Were you taught about evolution in your high school biology course? A. Yes; B. No.

6. Which of the following best agrees with your impression of the modern theory of evolution? A. The phrase "Survival of the Fittest"; B. Evolution occurred because different individuals left different numbers of offspring; C. Man evolved from either the gorilla or chimpanzee in Africa; D. Evolution involved a purposeful striving towards "higher" forms, (that is a steady progress from microbes to man); E. Evolution occurred because the strong eventually eliminated the weak.

7. Do you think that the modern theory of evolution has a valid scientific foundation? A. Yes, because it is possible to test many "predictions" of evolutionary science; B. Yes, even though we can never test "predictions" about events in the past; C. No, because we can never be sure about the past; D. No, because evolutionary science is principally based on speculation, and not on "hard" facts; E. No (for other reasons).

8. Is it your impression that most scientists now believe that the modern theory of evolution is not a valid scientific theory? A. Yes; B. No.

9. Do you believe that the teaching of concepts which rely on a purely naturalistic explanation of the world, such as that used in the modern theory of evolution, might eventually lead to a "decay" of American society? A. Yes; B. No.